The Slippery Slope Argument in the Ethical Debate on Genetic Engineering of Humans

Abstract: This article applies tools from argumentation theory to slippery slope arguments used in current ethical debates on genetic engineering. Among the tools used are argumentation schemes, value-based argumentation, critical questions, and burden of proof. It is argued that so-called drivers such as social acceptance and rapid technological development are also important factors that need to be taken into account alongside the argumentation scheme. It is shown that the slippery slope argument is basically a reasonable (but defeasible) form of argument, but is often flawed when used in ethical debates because of failures to meet the requirements of its scheme.

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1. Introduction

Slippery slope arguments are taken to be one of the main arguments relevant to controversies about genetic modification of human beings carrying over to next generations. Slippery slope arguments are about dangerous consequences that might come about in the future, typically a distant future, at a point where actions or policies that are being considered now might or might not lead to a catastrophic outcome in the long term. Therefore, in complex situations concerning the intersection of scientific research and political developments and policies, evaluating a slippery slope argument as weak or strong at the point where the action is being considered is to some degree a matter of conjecture. Even so, it is argued in this paper that the slippery slope arguments used in the example of the current debate on human genetic engineering can be helpfully analyzed and evaluated using argumentation methods.

The slippery slope argument is generally classified in logic textbooks and on writings in ethics as an informal fallacy (Barry, 1976; Hurley, 1982). In the case of ethical debates on genetic engineering it is not too hard to see why this is so. In its simplest form, the slippery slope argument contends that allowing the use of gene therapy of the kind that affects future generations will inevitably lead to eugenics, the attempt to create a super race of human beings through the use of genetic technology. For this reason, the argument contends, we should never allow the first step of applying this kind of genetic technology to humans. However, recent work in logic has shown not only that the slippery slope argument can be reasonable in some instances, where the right requirements are met, but it also has a basic logical form that can be specified and that lays out these requirements. This paper builds on and extends previous work (Walton, 2015) showing that a slippery slope argument can be reasonable if it fits the basic argumentation scheme, and applies this previous work to modeling some kinds of slippery slope argument used in current ethical debates on genetic engineering. The method advocated is to apply what is called an argumentation scheme to the particulars of a slippery slope argument put forward or discussed. According to this method, the argument can be checked for faults by comparing the way it was put forward to the scheme for the slippery slope argument to see if the requirements for the scheme have been met.

2. The Advancing State of Gene Therapy

Gene therapy can be defined as the transplantation of normal genes into cells in place of missing or defective ones in order to correct genetic disorders. Adenosine deaminase (ADA)

deficiency is an inherited disorder that damages the immune system and causes the loss of immune protection from bacteria and viruses. Repeated and persistent infections can be life-threatening. The first FDA-approved gene therapy experiment in the US occurred in 1990, when Ashanti DeSilva was treated for a faulty gene that results in the ability to produce adenosine deaminase (ADA), leaving her dangerously vulnerable to even weak infections. Researchers incorporated some of her white blood cells into a virus made to contain a healthy ADA gene and injected the cells into her body. Since this first successful gene therapy case, 2,000 clinical trials have been conducted or approved up to January 2014.

There are two kinds of human therapies, somatic cell gene therapy and germline gene therapy. A germline is a series of germ cells each descended or developed from earlier cells in the series, regarded as continuing through successive generations of an organism. This means that germline cells are reproductive and can affect future generations of an organism. Somatic gene therapy refers to the placing of the therapeutic genes into the somatic cells of the patient.[1] The expression 'somatic cell' refers to any cell of a living organism other than a reproductive cell. Any effects are restricted to the individual patient only, and are not inherited by the person's offspring or later generations. Somatic gene therapy is the mainstream line of current research. Several somatic cell gene transfer experiments are in clinical trials to treat severe genetic disorders such as immunodeficiencies, hemophilia, and cystic fibrosis. Another example of somatic cell gene therapy is the insertion of bone marrow to avoid complications of organ rejection.

In contrast, germline gene therapy does affect future generations, so that the same disorder in the offspring of the treated individual would also be corrected. The germline in a multicellular organism is the population of the organism's cells that are so differentiated that their genetic materials are passed onto an individual's progeny in the usual processes of reproduction. Although germline gene therapy has promise for treating genetic disorders and hereditary diseases, many countries such as Australia, Canada, Germany, Israel, Switzerland, and the Netherlands prohibit its application to human beings. The U.S. has no federal legislation specifically addressing human germline or somatic genetic modification. The National Academy of Sciences, National Academy of Medicine, Chinese Academy of Sciences, and the Royal Society of the UK, conducted an International Summit in Washington, D.C., in December 2015 on ethical issues arising from recent scientific developments in human gene editing.

Sickle cell anemia, hemophilia and many other diseases make the body suffer from or succumb to a disorder arising from the missing or garbled parts of the DNA sequence. Crippling diseases of this kind affecting children have driven parents and medical researchers to try to find genetic technologies to provide a cure. A discovery in biology has led to a new technology providing a breakthrough in this quest. It uses a feature called clustered, regularly interspaced short palindromic repeats (CRISPR) to make RNA, a molecule that stores genetic sequences of letters. Scientists have been able to exploit this discovery to make a tool for gene editing that can cut through a DNA sequence to target a precise part of it that is broken, cut the old section out and replace it by a new one that is not defective.

Research on this new technology has become a hot topic in biology. It is been applied to dozens of animal species successfully, and because it is easy to use and not expensive compared

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[1] Here is a simplified version of the definition given in the FDA guidelines. The term *somatic cell therapy* refers to the administration of living non-germline cells to humans from the same individual or from the same or different species, other than transfusable blood products, for therapeutic, diagnostic, or preventive purposes. www.**fda**.gov/.../Guidances/Cellularand**GeneTherapy**/ucm072987.htm

to the previous genetic technology, it has enormous potential for treating human diseases. For example, a firm called Editas Medicine based in Cambridge Massachusetts hopes to start human clinical trials of CRISPR in 2017 to treat a rare genetic form of blindness called Leber congenital amaurosis (*The Economist*, Time to Think Carefully, December 5, 2015, p. 79).This potential has led to considerable investments by large pharmaceutical companies, driving the research forward, and led to start-up gene therapy companies. Although there have been ethical concerns about where the numerous applications of gene editing might lead, it is conjectured (*The Economist*, Briefing: Genome Editing, August 22, 2015, 22) that the needs of the sick will continue to drive gene editing technologies forward in science and medicine.

Future benefits of germline modification of animals include the ability to drive a gene through population, for example one that could make it impossible for mosquitoes to spread the organisms responsible for malaria. A *gene drive* is a technique that spreads the inheritance of a particular gene into the chromosomes of an entire population. In 2015, researchers at the University of California, Irvine, claimed to have used CRISPR to build a gene drive for mosquitoes that would make mosquitoes resistant to the parasite that causes malaria (*The Economist*, Time to Think Carefully, December 5, 2015, p. 79). These useful and potentially obtainable prospects are powerful forces propelling the acceptance of genetic technologies and treatments forward at the present time, and in the present climate of social opinion.

3. Prior Versions of the Slippery Slope Argument: A Brief Summary

Before we can present the basic scheme of the slippery slope by arguing that it is an improvement on previous versions we have to take a quick look at the previous literature. Readers not interested in this subject, or who already know about it, can skip this section.

Slippery slope arguments are widely used in biomedical ethics and law, where they are recognized as reasonable arguments, even though they can be tricky to evaluate (Schauer, 1985, Van der Burg, 1991). Another fairly recent trend is that the slippery slope argument is being included in informal logic textbooks, often in the section that treats of informal fallacies such as begging the question or argument from authority. The trend in the literature on these fallacies is that many of them are now recognized as arguments that are not inherently wrong as arguments, but can in many instances have reasonable uses as well. The problem is to devise criteria and methods to enable an argument analyst to evaluate such arguments so as to distinguish between those that are fallacious, or at any rate are in certain respects defective, and those that are reasonable arguments.

It has not yet been precisely established where or when the expression 'slippery slope argument' first entered into logic as discipline, or when it began to be treated by logic textbooks as a type of argument to be included in the curriculum. But it is known that the slippery slope argument is related to the *sorites* argument of the ancient Greek philosophers (Kneale and Kneale, 1962, 114). This form of argument has two premises and a conclusion.

Premise 1: If you take one grain away from a heap, it makes no significant difference - you still have a heap.
Premise 2: Each time you repeat this step, it makes no difference, because one grain is too small to make a difference between something being a heap or not.
Conclusion: Repeated long enough, the conclusion of this reasoning will become absurd, for it will become obvious that what is left can no longer be described as a heap.

This same form of argument is called the bald man argument when the example is used of a man who has a full head of hair plucking out one hair at a time. To begin with, he is not bald, and at the end he is bald. But it is impossible to determine the exact point at which he has made the transition from being not a bald man to a bald man. This form of argument is often held to be a paradox. However its structure is different from the kind of slippery slope argument we are concerned about in this paper, because the latter type of argument is about a sequence of actions that leads to some dangerous outcome, and one party is warning another not to take the first step in the sequence because it will lead to the dangerous outcome. When we say such arguments are reasonable, it is not required that they be deductively valid arguments. They typically represent defeasible forms of argumentation that are subject to exceptions. Such arguments can lead from acceptable premises to a conclusion that is presumptively acceptable, subject to new evidence that might come into the case at issue.

Nevertheless, it can be seen that there are some interesting similarities between the two types of argument. Both are based on a continuing sequence, and with both forms of argument once the sequence moves forward and is not stopped, it enters into the gray zone lacking any particular point where it can be determined whether a property is present or not.

An early textbook in informal logic (Beardsley, 1966, 176) included the slippery slope argument under the heading of informal fallacies. Although he described slippery slope arguments as often alarming enough to be persuasive even when they are weak and insufficiently substantiated, he appeared to leave room for the possibility that such arguments are not inherently fallacious.

Hook (1970, 47), quoted below, outlined the slippery slope argument as follows.

> This mode of thinking takes its point of departure from the fact that conflict of principles or values sometimes compel us to take a necessary risk whose dangers are manifest. It then asks: where does one stop? And since in advance no one can indicate a specific stopping point, it assumes that one can never stop but that once we step on the slippery slope we must descend at an accelerated speed into the dreaded abyss of catastrophe, however conceived.

His first example is the argument of those who protest against putting fluorine in drinking water to prevent tooth decay on the ground that once we start to add poisons, there is no way to know where we will stop, and we may even end up by adding cyanide. His example, and his use of the expression "one can never stop" in his description of the argument above, may suggest that he is taking the slippery slope argument to be fallacious. Hook did not call it a fallacy but he did advise his readers how to critically question this type of argument when confronted with it, and how to respond to it by posing counterarguments.

There are also linguistic difficulties in naming the slippery slope type of argument. There is a wide variety of colorful terms associated with the slippery slope argument such as the wedge argument, the dam burst argument (Saliger, 2007), the snowball argument, the domino argument and the camel's nose in the tent argument. Saliger (2007, 342) takes the dam burst argument to be the same as the slippery slope argument, but classifies the domino argument as different from the other two. The slippery slope argument is also known as the thin edge of the wedge argument, the opening of the floodgates, etc.

In this paper it is not possible to try to settle the confusing varieties of terms used to describe and classify this type of argument in relation to other types of arguments that it is associated. We will make a little headway in this paper, by distinguishing between the slippery slope type of

argument and another important type of argument: argument from negative consequences. But beyond that, no attempt will be made to classify or define all these terms. However, by presenting an argumentation scheme for the basic slippery slope argument, a starting point for these and other investigations of the slippery slope argument will be set in place.

4. A Basic Argumentation Scheme for the Slippery Slope Argument

Even labeling someone's argument as a slippery slope can be highly intimidating to the person whose argument has been criticized. Merely saying that it is a slippery slope argument somehow makes it sound bad or suspicious, and because of the difficulty of identifying slippery slope arguments, in the absence of the kind of precise analysis put forward in this paper, the arguer employing slippery slope is not only put on the defensive but hamstrung. Another reason that this kind of move is highly important to recognize is that so many slippery slope arguments are expressed in a compressed form so that it seems difficult or even impossible to know what to do next, unless one has some precise argumentation scheme defining what the requirements are for an argument to fit the category of a slippery slope. Even a very sketchy and feeble slippery slope argument can put the other side on the defensive, since the argument may seem scary, and there may seem to be no convincing way to attack it, given the absence of evidence of an explicit kind. For these reasons, the first step in addressing any argument that looks like a slippery slope argument is to see if it fits a precisely formulated argumentation scheme identifying it premises and conclusion as a type of argument. The scheme is an abstract structure that can be applied as a normative model to instances of natural language argumentation to see if the given argument fits the requirements of the scheme or not.

Holtug (1993, 403) frames the situation of the slippery slope argument as one where an agent is considering carrying out an action A where carrying out A might also commit the agent to carrying out other actions that flow from this initial action. The agent could become committed to carrying out another action B, once it has committed itself to carrying out action A because there is a sequence of actions $A_1, A_2, \ldots, A_n$ intervening between A and B. For example, bringing about A could lead to bringing about B by establishing a precedent through a series of court decisions.

Launis (2002, 174) showed how the structure of the slippery slope argument is also built around the ancient philosophical difficulty of vagueness of a kind which is associated with what is called the gray zone factor in (Walton, 1992). In a slippery slope argument, the movement towards the ultimate catastrophic outcome is propelled forward until it enters into a gray zone somewhere in the middle of the sequence from A to B that cannot be precisely pinpointed. Once the agent has proceeded into the gray zone it starts sliding down a slippery slope from one action to the next. It has lost control over its actions and therefore there is an inevitable descent to the final catastrophic outcome B.

Corner et al. (2011, 134) commented that it is simple enough to produce an intuitive characterization of slippery slope arguments, but the intuitive accounts that have been given have fallen short of providing a comprehensive definition. Nevertheless, some characteristics have been clearly identified that are helpful in building a comprehensive definition.

According to Rizzo and Whitman (2003) there are three characteristics that are common to all slippery slope arguments: (1) an initial, seemingly acceptable decision, (2) a dangerous outcome that is unacceptable, and (3) a process or mechanism leading from the initial decision to the dangerous outcome. Corner et al. (2011, 135) offer a fuller account that states that slippery slope

arguments have four components: (1) an initial proposal for action, (2) an undesirable outcome, (3) a belief that allowing the action will lead to a reevaluation of the undesirable outcome in the future, and (4) the rejection of the initial action proposed, based on this belief. There is a particular problem with both these accounts if they are put forward as definitions of what a slippery slope argument is. They do not provide a way of distinguishing between slippery slope arguments and arguments from negative consequences.

Argument from negative consequences is a form of argument that fits an argumentation scheme (Walton, Reed and Macagno, 2008, 332).

> Premise: If action A is brought about, negative consequences will (or may) occur.
> Conclusion: Therefore A should not be brought about.

But the argument from negative consequences is not the same kind of argument as the slippery slope argument. It is more general. To be a slippery slope argument, an argument from negative consequences has to have several other components. First, the action A has to be the first step in a sequence leading through a gray zone to an ultimate outcome. Second, there also has to be an element of loss of control involved that takes place during the gray zone. Third, the ultimate outcome has to be describable as catastrophic, i.e. it has to have high negative value.

Two examples (Corner et al. (2011, 135) can be used to illustrate the distinction between argument from negative consequences and the slippery slope type of argument. Consider the argument that opposing the legalization of cannabis because it would lead to an increase in lung disease. This is an argument from negative consequences. But consider the argument that if cannabis is legalized, attitudes towards harder drugs will become more positive, leading to the legalization of harder and harder drugs, leading to the ultimate outcome that drugs such as heroin will become legalized. This can be classified as a slippery slope argument, when some implicit premises are identified. The task of identifying implicit premises in a slippery slope argument is an important one for argumentation studies. Formulating an argumentation scheme for the slippery slope argument is the first step toward accomplishing this task.

According to the model of the slippery slope argument built in (Walton, 1992, 208), there are ten general characteristics that can be used as criteria to determine whether a given argument in a natural language text fits the requirements for a slippery slope argument.

1. There are two agents engaged in a deliberation dialogue on what course of action to take in a situation requiring choice, and the one agent is contemplating an action, while the other (the critic) is raising doubts about the practical wisdom of taking this action.
2. The critic postulates a sequence of further actions that the agent will likely carry out, one step at a time, where each step naturally leads to the next one.
3. According to the critic, the final step in the sequence is catastrophic, meaning that it is highly negative for the agent, and the agent wants to avoid at all costs.
4. There are factors called drivers (section 6) that propel the argument along the sequence from one step to the next.
5. During the earlier part of the sequence the agent retains control of whether to stop moving from one action to the next.
6. There is a gray area along the sequence of actions, and somewhere within this gray area the agent loses control of continually moving from one action to the next.
7. The gray area cannot be precisely specified by pinning it down to any particular action where loss of control starts.

8. Once the agent enters into the gray area, she must continue the procedure of bringing about further consequences in the sequence
9. Once the sequence of actions comes out of the gray area, the agent has lost control and must proceed inevitably towards the final catastrophic outcome
10. The critic argues that the agent should not take the first step, because if she does, she will be led to unpredictably lose control, and then will be unable to avoid the catastrophic outcome.

Argumentation schemes for four types of slippery slope arguments have been developed in (Walton, 1992, 288). The ten characteristics have been used to define a basic argumentation scheme (Walton, 2015, 288) covering all four types of slippery slope type of argument. The sequential premise gives the slippery slope argument a recursive property. The argument is applied over and over from one step to the next as the series of actions is propelled forward.

Initial Premise: An agent α is considering carrying out an action A_0.
Sequential Premise: Carrying out A_0 would lead to A_1, which would in turn lead to carrying out A_2, and so forth, through a sequence $A_2, \ldots, A_x, \ldots A_y, \ldots, A_n$.
Indeterminacy Premise: There is a sequence $A_0, A_1, A_2, \ldots, A_x, \ldots A_y, \ldots, A_n$ that contains a subsequence $A_x, \ldots A_y$ called the gray zone where x and y are indeterminate points.
Control Premise: α has control over whether to stop carrying out the actions in the sequence until α reaches some indeterminate point in the gray zone $A_x, \ldots A_y$.
Loss of Control Premise: Once α reaches the indeterminate point in the gray zone $A_x, \ldots A_y$, α will lose control and will be compelled to keep carrying out actions until she reaches A_n.
Catastrophic Outcome Premise: A_n is a catastrophic outcome that should be avoided if possible.
Conclusion: A_0 should not be brought about.

A slippery slope argument that fits all the requirements for this argumentation scheme can be a reasonable argument. This does not mean that the argument has to be deductively valid. It only means that the argument is defeasibly valid, meaning that the premises collectively offer a reason for tentatively accepting the conclusion, subject to critical questioning and to new information that might enter into the example as the deliberation proceeds. In other words, the premises give a tentative reason for accepting the conclusion in a given case, assuming that (1) the given argument contains all the premises in the scheme, and (2) these premises are supported by sufficient evidence so that the argument meets the appropriate standard of proof.

An example, a condensed version the one given in (Walton, 2015, 285-286), is the best way to show that slippery slope arguments can be reasonable in some instances. A mother is advising her daughter not to take drugs, even though she has been offered some drugs at a party and is somewhat tempted to try them. The mother might argue that drugs are addictive and once the daughter starts taking them, they give a pleasant sensation, and she is likely to continue taking them. However, the mother points out that the problem is that as the process of taking drugs continues, eventually it becomes harder and harder to stop taking them because of the withdrawal symptoms. She points out that the danger is that there is no particular point where you know you have to stop in order to avoid the catastrophic outcome of becoming a helpless drug addict. It requires quite a bit of work to fit an individual case such as this one to the requirements of the argumentation scheme for the slippery slope argument, but here it can be hypothesized that in some cases it is possible to do so. If this hypothesis is correct, sometimes the slippery slope form of argument can represent a reasonable argument. That is, it might offer

good reason for someone engaged in a deliberation about whether to take some action to reconsider taking the action, if the outcome it might lead to is agreed to be disastrous.

5. The Context of Public Deliberation

Basically a slippery slope argument of this type is a species of argument from negative consequences, which is a reasonable form of argument, even though in some instances its uses may be flawed. A slippery slope argument is a special type of argument from negative consequences that has a number of additional premises required. For this reason it is a type of argument that requires a special argumentation scheme in its own right.

At the time of writing this paper the main ethical issue relevant to the slippery slope argument is that we are currently in the gray area where we are able to make the decision on whether to allow or forbid the application of germline therapy to humans. A more likely outcome is that germline therapy will provide such wonderful treatments for human diseases that medical applications of it to humans will move forward and we will be confronted with the legal, social and ethical issue of where to draw the line restricting its use to certain categories of cases. Now is the time for this discussion, and the slippery slope argument is one of the arguments that needs to be discussed. The most likely scenario is that there will be a gradual movement towards the adoption of genetic enhancement technology, whether we like it or not because of the way this technology is developing, so that once germline therapy becomes successful and part of the standard medical reproductive services available to parents, everyone will gradually be driven to accept it and take part in it. In particular, competition, both among individuals and nations will drive the enhancement and acceptance of genetic technology forward. In the end, genetic enhancement technology will be adopted and incorporated into the legal and political systems of the competing nations (Gardner, 1995, 74). The problem is a familiar one. Suppose a technology is developed to the point where it can be applied, and has been shown to have great benefits for those who will apply it. Once public and legal acceptance is gradually secured, it is virtually inevitable that it will be used. So in this kind of case we can see in general outline that the slippery slope argument is applicable as an argument against allowing the application of germline therapy to humans. In outline we already have a general idea of the mechanism, the sequence of actions, events and policies that lead from the initial action to the final outcome.

Next it is shown how the current deliberations on the ethics of germline therapy fits into a network of current factual circumstances and plausible hypotheses drawn from them about what is likely to happen in the near future. The list of twelve propositions below chronicles the connected sequence of events that fits the sequential premise of the argumentation scheme for the slippery slope argument.

1. The success of somatic gene therapy has supported public acceptance of genetic therapy.
2. Crippling diseases affecting children have led parents and researchers to consider other genetic technologies.
3. Germline therapy has shown promise for treating genetic disorders.
4. The enormous potential germline therapy has led to large investments by pharmaceutical companies.
5. Genetic therapy will become a standard medical service available to parents.
6. Once germline therapy is accepted as safe and inexpensive, there will be a shift in favor of genetic enhancement.
7. Parents begin to see genetic enhancement as an advantage for their children.

8. Propensity to adopt genetic enhancement is increased among parents.
9. Increased visible variance appears in human abilities.
10. Children treated with genetic therapy perform better competitively than others.
11. Others see the advantages of using genetic technology
12. Germline therapy is adopted by nations who want to compete.
This sequence of events that fits the sequential premise of the argumentation scheme for the slippery slope argument reveals an important characteristic of how the slippery slope works in the ethical debate on advancing genetic technology. Social factors of public acceptance of the new genetic technology are very important.

The reason for the importance of social factors of public acceptance is that the issue is one of public policy deliberation where whole countries are trying to formulate laws that determine which actions are allowed and which are forbidden. Among the therapies to be considered is the adoption of genetic enhancement by parents to improve the cognitive abilities of their children, enabling these children to do better in education and in the job market.[2] Once the experience of the public with safe genetic enhancement technology accumulates, and the procedure is seen as efficient and safe, there will be a shift in favor of enhancement (Gardner, 1995, 72). Once safe and effective germline therapies are developed, genetic engineering could become part of the standard medical reproductive services available to parents. Once these benefits become apparent to the public, politically it will be very hard to restrict access to them. What drives the slope forward is the public acceptance of the new technologies. To accommodate the role of these social factors of public acceptance in the structure of the slippery slope argument, it needs to be realized that the basic argumentation scheme for the slippery slope argument, in order to be applied to real cases such as the arguments used in the ethical debate on genetic engineering, need to be set into the context of dialogue. In this instance, the context is one of the public policy deliberation where the advancement of a new technology is forcing a public discussion on what to do in light of the reality that a decision has to be made on whether to permit or forbid the advent of new technology that can change human reproduction, and that can have significant consequences for eliminating genetic defects that cause much grave humans human suffering. Hence the core argument structure of the slippery slope argument modeled by the basic argumentation scheme needs to be supplemented by taking into account additional factors that drive the argumentation forward in a social setting of public deliberation.

6. The Drivers

Social factors driving the argumentation forward in slippery slope arguments have been recognized by acknowledging factors called the drivers along the slope (Walton, 2015, 288) that can vary from one real example to another. A *driver* is a catalyst that pushes the sequence of argumentation forward from each step to the next making it harder for the agent to resist continuing down the slope. Once the agent carries out an action Ai he will be impelled forward to take the next action Aj of the sequence. There can be more than one driver in a slippery slope argument, and different drivers can come into play at different parts of the sequence. Drivers include such factors as precedent, social acceptance, vagueness and technological change.

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[2] It may be questionable however whether the assumption that germline genetic engineering could succeed in identifying gene loci that could be manipulated so as to increase characteristics like personal strength, intelligence or beauty. Because most genes serve multi-purposes in development it appears unlikely that, for example, intelligence could be increased without introducing serious effects on other gene-controlled characteristics.

The example of the slippery slope argument in genetic engineering is in fact an excellent illustration of how drivers are moving this sequence of steps forward over a potential slippery slope argument. Research on genetics is going forward daily and leading to impressive achievements showing promise for medical treatments of some severe illnesses and diseases. The advent of the technology of genetic editing has recently added powerful new drivers. Three drivers can be especially identified: the desire of medical researchers to do something for sick children suffering from genetic disorders, the profitability of this new technology (especially for venture-capital firms and pharmaceutical companies), and the potential of using genetic editing tools to provide much-needed treatments for cancer and HIV (*The Economist*, Briefing: Genome Editing, August 22, 2015, 19-22).

Somatic gene therapy is already a reality, and showing promise of more discoveries. Germline therapy has not been performed on humans yet. There are first attempts at experiments, without any therapeutic aim, but this is far from actual clinical applications. But with the advent of CRSPR the technology is moving ahead faster. A fourth driver is a social climate of acceptance favoring the wider adoption of the technology in societies where there is competition for education, jobs, and other benefits. Use of successful genetic enhancement therapy by some parents would change society with social consequences of a kind that would to drive its wider adoption forward. Genetically enhanced children will have improved cognitive abilities and be more successful in education in the workplace. Children who do not have the benefit of genetic enhancement technology will increasingly lose in the competition for social and financial goods (Gardner, 1995, 74). The need to compete would drive the parents of the disadvantaged children, and others as well, to adopt genetic enhancement therapy.

Some drivers, and the transitions where they can be located in the sequence of actions, are displayed in figures 1 and 2. The drivers act as background factors that give us a way of estimating the likelihood that in the current circumstances the slippery slope argument will drive forward to eventually needing in its ultimate disastrous outcome.
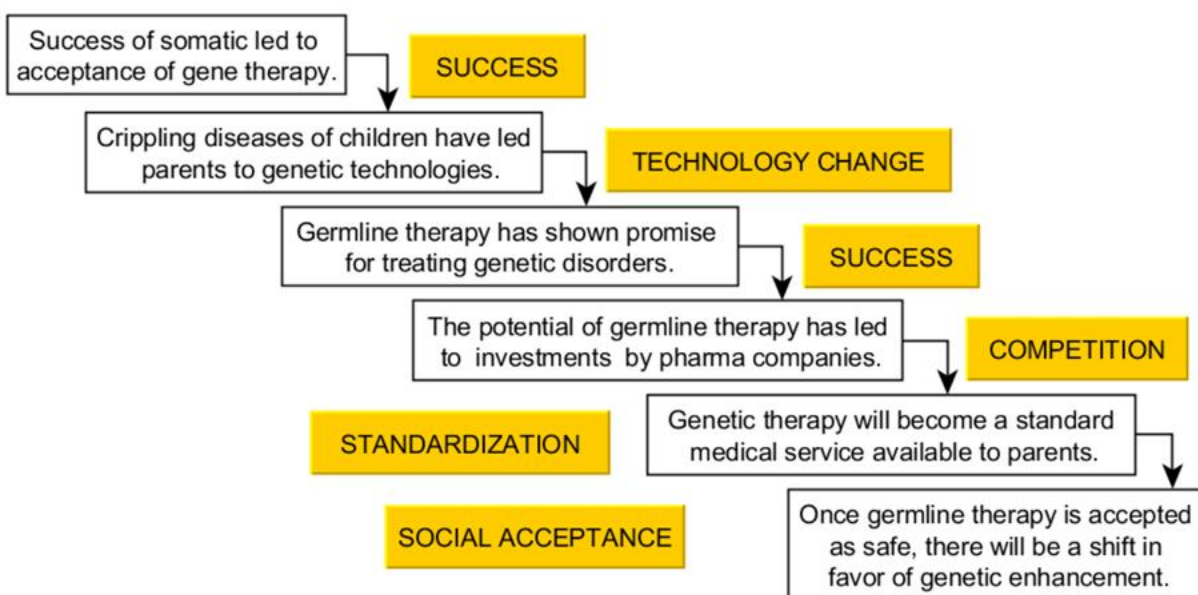

Figure 1: Top Drivers in the Sequence of Actions and Events

In figures 1 and 2, joined together as indicated, the drivers are shown as relating to the evidential links governing the transition from one step in the sequence of actions to the next step in the time line. The drivers are indicated to the right, or in the last two instances, the left of these evidential links.

   As mentioned in section 3, somatic gene therapy is already in clinical trials to treat genetic disorders such as immunodeficiency disorders, hemophilia, and cystic fibrosis. It is also used in the insertion of bone marrow to avoid complications of organ rejection. These circumstances support the propositions in the first two steps of the sequence of actions shown in figure 1. The first four steps in the sequence shown in figure 1 have already been taken. They are now in the past. But the two last steps in the sequence take us into the future. They are merely hypotheses about what might happen in the future. In this time line, we have already gone beyond taking the first step in the slippery slope argument.

   Germline therapy on humans has not yet been carried out. But progress with some related developments could be mentioned here. In a technique called preimplantation genetic diagnosis (PGD) scientists in the field of reproductive genetics use an embryo screening procedure to identify genes that can cause a deadly disease. Then the scientists can insert only embryos into a mother's womb that are free of the genetic defect known to cause the disease. Currently PGD can be used to prevent diseases such as muscular dystrophy, sickle cell anemia, hemophilia, genetically caused colon cancer, genetically caused breast cancer, and even some forms of Alzheimer's disease. There are already several labs in the U.S. that provide this kind of genetic testing. This does not imply, however, that germline gene transfer is already in place as a medical procedure. In these cases, genetic information is being used for selection but no cells are being altered. So far then, no there has been no case of human germline genetic modification. Following a medical procedure in 2001 some children born were said to have three genetic parents, since the children have DNA from the donor as well as the mother and father. However, these were not instances of human germline therapy, in the sense meant here, because the gene transfer was merely a side effect of the infertility procedure.
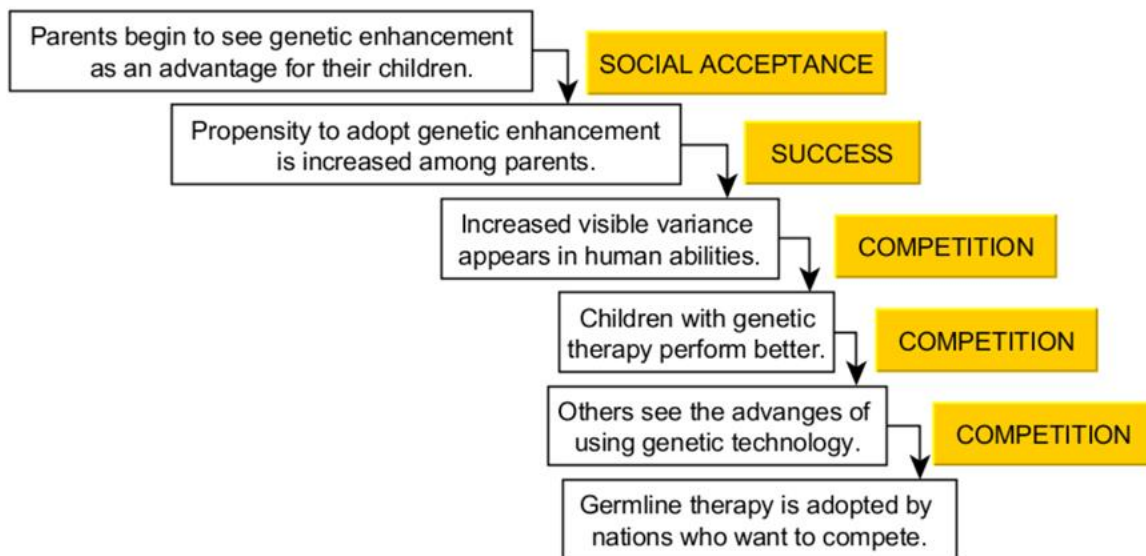

Figure 2: Bottom Drivers in the Sequence of Actions and Events

Figure 2 takes us forward from the last two steps in figure 1 to another sequence of propositions. These propositions are all hypotheses about what might possibly happen in the future, flowing from the sequence of events shown in figure 1. The drivers are indicated at the right of each evidential link joining one proposition to the next one. Once we see this timeline of actions and events, and especially in light of the recent rapid developments in genetic editing, it may well be that we are not only on a possible slippery slope leading to the acceptance of the human germline therapy. Perhaps it could even be suggested that we are now well enough along the sequence that is already impossible to turn back, or at least increasingly difficult to do so. But we could stop the sequence from moving forward to what would be taken by many to be a catastrophic outcome by drawing a bright line somewhere so that some of these treatments could be legally prohibited, or at least contained by legal rulings.

Having now identified the drivers that fit into the sequential premise of the argumentation scheme for the basic slippery slope argument, we can now proceed to the issue of how well the other premises of the basic scheme, and the conclusion, can be applied to the kind of slippery slope argument that seems to be most powerful and persuasive in the current ethical debate on human germline therapy.

7. Taking Values and Drivers into Account

The slippery slope argument is a subspecies of argument from negative consequences (as shown in section 4), which is in turn a subspecies of argument from values. Argumentation from positive consequences presents a reason to accept a proposal for action tentatively, subject to counter-arguments that may be advanced by the other side. Argumentation from negative consequences presents a reason to reject a proposal for action tentatively, again subject to counter-arguments that may be put forward later. Both arguments from positive and negative consequences have been shown to be species of a more general type of argumentation called argument from values (Bench-Capon and Dunne, 2002; Walton, Reed and Macagno, 2008, 321).

The first argumentation scheme below represents the form of argument from positive value.

Major Premise: If value *V* is positive, it supports commitment to goal *G*.
Minor Premise: Value *V* is positive as judged by agent *a*.
Conclusion: *V* is a reason for *a* to commit to goal *G*.

Argument from negative value is represented by the following scheme.

Major Premise: If value *V* is negative, it gives a reason to retract commitment to goal *G*.
Minor Premise: Value *V* is negative as judged by agent *a*.
Conclusion: *V* gives a reason for *a* to retract commitment to goal *G*.

One can see that both variants of argument from consequences species of value-based arguments. Both variants are based on the assumption that consequences of an action can be designated as having positive or negative value. However, arguments from positive or negative values can also operate as individual arguments in their own right independently of argument from consequences. The slippery slope argument needs to be seen as resting on a premise that the final outcome of the sequence is catastrophic. This claim needs to be seen as resting on argumentation

from values, so that part of the new premise makes the claim that it is being based on values, such as the value of safety.

An important conclusion drawn from this observation is that the basic argumentation scheme for the slippery slope argument of (Walton, 2015, 280) needs to be reformulated. According to the previous version, the catastrophic outcome premise states that the final action in the sequence is a catastrophic outcome that should be avoided if possible. As stated, this conclusion is partly redundant. Since it says that the outcome should be avoided if possible, it implies the conclusion that the initial action A_0 should not be brought about. This way of framing the scheme needs to be reconfigured so that the catastrophic outcome premise simply states that A_n is a catastrophic outcome.

Once the slippery slope argument is reconfigured in this way, two things are made much clearer. One is that there is a clear and distinct burden of proof on the proponent of the slippery slope argument, if her argument is to be properly supported, to show that there is evidence for the claim that the outcome is highly negative in nature. The other is that in order to properly qualify as a slippery slope argument, any argument put forward in natural language discourse, such as the genetic slippery slope argument studied in this paper, have to be based on a particular premise stating explicitly that the outcome of the argument is catastrophic, meaning that it strongly contravenes values held by the audience or the party to whom the argument was directed. The formulation of this premise of the slippery slope argument and its linkage to the conclusion is especially shown to be dependent on argument from values, and susceptible to differing definitions and value-laden choices of terminology by its defenders and attackers.
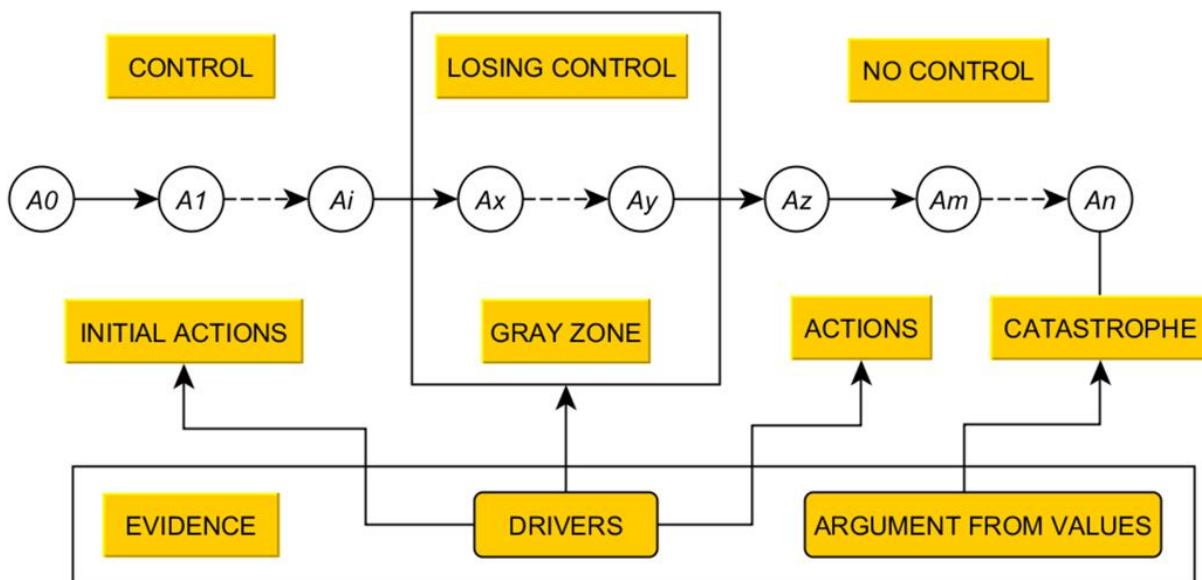

Figure 3: Inputs, Evidence and Output of the Slippery Slope Argument

What has been brought out is that the slippery slope, as modeled in this paper, takes inputs and links them into a characteristic sequence so that they produce an output. How these elements are combined to produce the outcome is shown in figure 3. The dashed line on an arrow indicates a continuing sequence in a series of intervening actions. The first input is an initial sequence of

actions $A_0, A_1, \ldots, A_i$ carried out by the agent during which the agent is in control, and can stop. The second input is that this sequence has to continue so that it enters the sequence of actions $A_x, \ldots, A_y$ in the gray zone. Once this has taken place, at some indeterminate point in this zone, the agent loses control and cannot stop moving forward with the sequence. The output is the sequences of actions $A_z, A_m \ldots, A_n$, ultimately producing the catastrophic outcome A_n. These elements have to be put together into this sequence in any real case by meeting all the requirements of the argumentation scheme. The scheme shows how to support the argument by being sure the right premises are in place, and by using the sources of evidence shown at the bottom of figure 3. It also shows how to attack the slippery slope argument by attacking the premises, or by attacking the evidence put forward to support these claims.

There are different ways to reformulate the slippery slope argument by bringing in value-based argumentation. One way is to argue that the sequence of steps will lead to a situation where there will be increasingly visible variants in human abilities, and this amounts to inequality. Equality is an important social value. Another point where arguments from values can be brought in is to argue that, in effect, the adoption of genetic enhancement technology by nations amounts to the acceptance of eugenics policies comparable to those adopted during the period of Nazi Germany. Now we definitely have characteristics strongly suggesting a slippery slope argument. This way to reformulate the argument is to claim that genetic enhancement technology to improve the cognitive abilities of children amounts to "eugenics". Along with the additional assumption that the adoption of eugenics would be a catastrophic outcome, for various reasons, we have more of the components needed to build what looks like a strong non-fallacious slippery slope argument against taking the first step of engaging in somatic gene therapy.

The term 'eugenics' was coined in 1884 by Francis Galton (1822-1911), a half-cousin of Charles Darwin (Galton, 1869). The eugenics movement was popular in the U.S., Europe and other countries including Canada in the late nineteenth and early twentieth centuries, and was at its peak in the 1920s. The scientific reputation of eugenics started to decline during the time when it came to be used as a justification for the racial policies of Nazi Germany. The eugenic movement applied a theory of heredity to reproductive practices, including sterilization, contraception, segregation, abortion, and euthanasia of the disabled. Eugenics held that persons deemed defective should be sterilized to ensure that they did not pass on their defects to the next generation (Bashford and Levine, 2010, 9). Eugenics as a social movement was popular in the first half of the 20th century, a time when eugenic programs such as genetic screening, birth control, compulsory sterilization, forced abortions and genocide were made policies in different countries. At the present time, the word 'eugenics' has negative connotations, implying something evil and fearful, tracing back to Nazi Germany.

Under the Nazi euthanasia program called Action T4, brought into existence by a euthanasia decree signed by Hitler in 1939, thousands of people judged to be incurably sick by medical examination were killed (Lifton, 1986). The program has been linked to other rationales, including Darwinism, racial hygiene, and eugenics. Doctors and midwives were obliged to register children with severe disabilities and these reports were evaluated by a panel of medical experts who had to give their approval before a child could be selected to be killed.

Once the term 'eugenics' is introduced to represent what is taken to be the outcome of the slippery slope in the ethical debate on whether germline therapy should be allowed or forbidden, the conclusion of the slope is rightly taken to be properly describable by using the term catastrophic, representing an outcome that is highly negative. However, in this paper we make no attempt to discuss whether the slippery slope argument in genetic engineering should be

extended so far that it takes into account the possibility of representing the conclusion of the slope argument as catastrophic by associating it with the term 'eugenic'. The debate here turns into a verbal one concerning how to define the term 'eugenic', and how to link this with the negative connotations of the term tracing back to Nazi Germany.

How the conclusion of the slippery slope argument is formulated has turned out to be especially important. Attacking the conclusion depends very much on the terminology used by the proponent of the slippery slope argument in phrasing the conclusion. Value-laden terminology comes to the forefront here, as it so often does in ethical debates on biomedical issues (Macagno and Walton, 2014). Gardner is not against the development of technologies for genetic therapy. He implies that its benefits could be so enormous that there are reasons seeing it in a positive light. Resnik (1994, 28) seems to agree with Gardner when he describes the widespread acceptance of genetic enhancement as not an inherently bad outcome, or one that should be avoided as a disaster. Of course, any argument about how bad the outcome will be, or whether it will really be good or bad, is speculative, and at present we lack enough evidence to decisively accept or reject it. Resnik adopts a view that is in line with Gardner's in that he concludes (1) that we cannot stop the slide from somatic gene therapy to genetic enhancement and (2) it is possible to practice genetic enhancement without contravening principles of ethics or social justice. Resnik (1994, 28) uses different language than Gardner, however, when he writes of a slide from negative to positive eugenics. The term 'eugenics' is highly controversial, and in fact is scary to many people because of its historical connotations. If we were to describe the conclusion of the slippery slope argument using the term 'eugenics', that would reframe the structure of the argument in a quite different way. It would suggest that the widespread adoption of genetic enhancement therapy at the bottom of the sequence of actions would be an outcome that would be catastrophic, or at least scary, something that should be avoided at all costs.

8. Critical Questions, Burden of Proof and Fallacies

Four special subtypes of the slippery slope arguments have been recognized previously, and each of them has its own distinctive argumentation scheme, and along with that, each of them has a matching set of critical questions (Walton, 1992). The critical questions are the tool used to begin the procedure of evaluating a slippery slope argument. Table 1 presents a new set of critical questions matching the basic scheme for the slippery slope argument.

CQ_1	What intervening links in the sequence of events $A_1, A_2, \ldots, A_i$ needed to drive the slope forward from A_0 to A_n are explicitly stated?
CQ_2	What missing steps are required as links to fill in the sequence of events from A_0 to A_n, to make the transition forward from A_0 to A_n plausible?
CQ_3	What are the weakest links in the sequence, where additional evidence needs to be given on whether one event will really lead to another?
CQ_4	Is the sequence of argumentation meant to be deductive, so that if the first step is taken, it is claimed that the final outcome A_n must necessarily come about?
CQ_5	Is the final outcome A_n shown to be catastrophic by the value-based reasoning needed to support this claim?

Table 1: Five Critical Questions Matching the Basic Slippery Slope Argument

When one party in a debate presents an argument that is recognized as a slippery slope argument, the respondent should begin the process of evaluating it by asking one or more of these critical questions, depending on which question seems most appropriate for the example. If the proponent fails to give an appropriate answer, the slippery slope argument is taken to default. But if an appropriate answer is provided, the slippery slope argument is taken to hold until such a point in the dialogue that the respondent asks another critical question or puts forward a counterargument attacking the original slippery slope argument.

Argumentation methods examine both sides of a debate, and evaluate any particular argument by weighing the pro arguments against the con arguments. An argument that fits this kind of argumentation scheme can carry presumptive weight but is defeasible, meaning it is open to defeat if new evidence comes in to the case. It was shown in the paper that the slippery slope argument is a species of another type of argument with an argumentation scheme, namely argument from negative consequences. For example, in order to decide on taking any form of medical treatment, the potential negative consequences (side effects) need to be taken into account. The slippery slope argument is more complex because it refers to a sequence of connected actions that might or might not occur, and might or might not lead to negative consequences at some distant point in the future. This form of argument is reasonable in principle in deliberation, and so what been shown is that the slippery slope argument is reasonable provided other conditions (specified by the scheme) are met.

On the other side of the coin, slippery slope arguments can be weak, open to critical questions, and subject to counterarguments. On the argumentation model, a defeasible argument can be attacked in one of three main ways: by attacking one or more of its premises, by attacking the conclusion by presenting counter arguments against this proposition, or by attacking the inferential link between the premises and conclusion, for example by asking a critical question. When deciding which is stronger, the original argument or the counterargument, it was shown in this paper that evidential factors called drivers, relating to the driving forward of the chain of argumentation from the premises to the conclusion (the claim that the predicted disastrous outcome will occur), need to be taken into account. These are social and political factors such as the advance of scientific research, the profit motive, the current climate of public acceptance among other factors identified in the paper, that drive the sequence of argumentation forward toward its ultimate conclusion. In the model presented above, these factors were shown to be part of the body of evidence needed to properly evaluate the kinds of slippery slope arguments studied in the paper.

There are two main steps in evaluating a slippery slope argument. The first is to apply the scheme to the real argument that is supposed to be a slippery slope argument, to see whether all the premises and the conclusion of the scheme can be identified. To be a valid slippery slope argument, the real argument has to demonstrably be able to fit the requirements of the scheme. The second step is to test to see whether the premises are adequately supported by the evidence available in the case. In the kind of case we are examining, this means looking at the arguments both for and against the slippery slope argument provided by the participants in the debate. It was shown that in this debate on genetic engineering, the evidential value of the link between the premises and conclusion of the slope argument depends on the drivers moving the slope forward toward the ultimate conclusion.

Within the framework of the current debate on the continuing of genetic therapy, the outcome of putting forward a slippery slope argument that meets all the requirements of the scheme produces a shift in the burden of proof in the debate onto the side of those who use the slippery

slope argument against continuing with germline therapy. An important component of studying such shifts is better understanding how the drivers work. Future work needs to extend the argumentation structure by fitting it into a context of deliberation dialogue by showing in a more precise way how the drivers are integrated into the scheme.

In order to make the slippery slope argument work, a burden of proof has to be fulfilled to support two assumptions by means of further arguments. The issue with respect to the first assumption is one of how the arguments on genetic engineering presented in this paper can (or cannot) be modified or extended to meet the requirement of the scheme. The extension requires that something can be a slippery slope argument if the procedure heading towards the catastrophic outcome is already beyond the start point but is still before the gray zone, so that the agent still has a choice of whether to stop moving ahead. This assumption could be supported by possible cases in which the sequence of actions is already beyond the start point but has not moved so far ahead that there is no possibility of stopping the slope by turning back.

The second assumption can only be supported adequately by arguments that offer an analysis of the dangers of genetic enhancement so that it can be shown that moving ahead with it leads to a catastrophic outcome. How could the burden of proof that should be required to adequately support this assumption be fulfilled? It could be argued, using argument from precedent, that because of the analogy between the earlier catastrophic precedent and the current situation where genetic therapy is rapidly moving forward, there is a good reason to fear a similar catastrophic outcome in the future. Or it could be argued that allowing germline therapy will lead to the use of genetic enhancement to create children that are taken to have superior abilities, and that the consequent variants in human abilities will violate the value of equality.

Slippery slope arguments are not always fallacious even if there might be something wrong with them. Sometimes the error, even though it can be spotted by asking a critical question, is merely a weakness that can be repaired by answering the question appropriately. Sometimes the error, however, is so serious that the term 'fallacy' deserves to be used. Cases of this sort typically happen when the respondent tries to avoid answering the question, for example by bringing in an irrelevant argument or otherwise trying to distract the audience in order to cover up the logical weakness. There are three main weaknesses relating to the set of critical questions.
1. The sequence supposedly leading from A_0 to A_n is not specified. The steps linking each event to the next are left implicit, or even worse, they are left up to the reader's imagination to fill in.
2. The claim that the outcome A_n is catastrophic (has a high negative value) is not supported well enough by value-based argumentation based on evidence showing specifically why it is so bad.
3. The sequence from the initial action A_0 to the outcome A_n is said to be inevitable, i.e. the slope argument is assumed to be deductive (monotonic).
Logic textbooks and other writings on the slippery slope fallacy often state that the slippery slope argument is a fallacy because the sequence of events from the first step to the catastrophic outcome is inevitable. For example, Barry (1976, 132) defines the slippery slope fallacy as "the fallacy of assuming an action will inevitably lead to a consequence when, in fact, there is no such inevitability". But the slippery slope arguments on human genetic engineering we have studied in this paper are about deliberations on what to do. Such arguments are about what might, may or must happen in the future and are therefore defeasible (non-monotonic), meaning that the conclusion can only be tentatively drawn, subject to retraction if new evidence comes in. Hence the use of the word 'inevitable' in a slippery slope argument should be taken as a red flag. Even when the argument has passed into the gray zone and the agent has lost control, it may not be necessarily true that the catastrophic outcome is inevitable. For example, in a case of a drug

addiction, the agent may have lost control, but other agents may do something about it, such as providing drug therapy that may avert the catastrophic outcome.

9. Conclusions

In this paper it has been shown that there are two main different slippery slope arguments that can be identified in the current ethical debates on genetic engineering concerning the application of current genetic technology to human subjects. One is that current developments in technology will take us over the boundary between somatic gene therapy and germline gene therapy. This argument is put forward by those who think that the acceptance of germline gene therapy is a catastrophic outcome in its own right. The other form of the slippery slope argument is not against the acceptance of germline gene therapy per se. It is against the danger that once germline gene therapy is set in place as an acceptable medical procedure, it will inevitably be used by parents who see genetic enhancement as an advantage for their children. These two arguments can be combined by arguing that germline gene therapy is catastrophic in itself, but what makes it even more so is that it will lead to parents using it to make their children taller or smarter, or to have other characteristics they like such as having blue eyes.

As has been stressed in this paper, the issue of permitting or forbidding germline therapy is not based on the isolated argumentation of a single person trying to decide whether to accept this kind of treatment or not. The argumentation needs to be set in a framework of deliberation that is social, that even involves whole countries, and is highly dependent on forming policies that will set laws in place. As the technology evolves, the debates will continue, and rules will be proposed by governments formulating statutes that will be binding on the courts, and will be subject to legal argumentation. What prevents the gray area from playing its part in generating a slippery slope argument is the formation of bright lines, clear rules that can tell us that we can only go so far in the sequence of actions and no further. It should be noted here that there is already potential for formulating such laws as the technology develops and the legislative debates and the courts become more familiar with it. It is useful to note that there is already a fairly sharp divide between somatic and germline therapy. Somatic gene therapy is done on an existing person who consents to the treatment. But germline therapy does not work by taking the child or the fetus to the clinic to have the treatment carried out. You could say that germline modification is done on a patient that does not exist yet. This intrinsic definition between the two kinds of genetic therapy suggest the legal and ethical possibilities of drawing a bright line to block the slippery slope argument from the one kind of treatment to the other.

We are still at an early stage of the debate, so the required evidential support for the premises of the slippery slope argument is not there yet. In spite of the technical possibility of proof in principle of somatic medical gene therapy, it is still hardly available for patients for various political and economic reasons. The FDA has not approved any gene therapy for sale yet. Speculations discussed in this paper still have a theoretical quality because they are about events in the future that might or might not really happen, and might be difficult to guard against. Many of the transitions in the sequence of twelve actions and events set out in section 5 which take the slippery slope argument from one step to another only indicate that it would be theoretically possible that the first step leads to the last step if all the intermediate steps turn out to occur. But now is a good time to have these deliberations about what might happen in the future, and think now about the choices that will have to be made then. These arguments can now be put forward

and criticized in a way that is more useful for guiding future deliberations on how to frame laws and social policies by using the basic argumentation scheme for the slippery slope argument.

References

Barry, V. E. (1976). *Practical Logic*. New York: Holt, Rinehart and Winston.

Bashford, A. and Levine, P. (2010). Introduction: Eugenics and the Modern World. *The Oxford Handbook of the History of Eugenics*, ed. A. Bashford and P. Levine. Oxford: Oxford University Press, 3-24.

Beardsley, M. C. (1966). *Thinking Straight*. Englewood Cliffs: Prentice-Hall.

Bench-Capon, T. J. M. and Dunne, P. E. (2002). Value Based Argumentation Frameworks, Technical Report: http://intranet.csc.liv.ac.uk/research/techreports/tr2002/ulcs-02-001.pdf

Corner, A., Hahn, U. and Oaksford, M. (2011). The Psychological Mechanism of the Slippery Slope Argument, *Journal of Memory and Language*, 64, 133-152.

Galton, F. (1869). *Hereditary Genius*. London: Macmillan.

Gardner, W. (1995). Can Human Genetic Enhancement be Prohibited?, *The Journal of Medicine and Philosophy,* 20, 65-84.

Hurley, P. (1982). *A Concise Introduction to Logic*. Belmont: Wadsworth.

Holtug, N. (1993). Human Gene Therapy: Down the Slippery Slope, *Bioethics*, 7(5) 402-419.

Hook, S. (1970). The Paradoxes of Freedom. Berkeley: University of California Press.

Kneale, W. and M. (1962). *The Development of Logic*. Oxford: Oxford University Press.

Launis, V. (2002). Human Gene Therapy and the Slippery Slope Argument, *Medicine, Health Care and Philosophy*, 5(2), 169-179.

Lifton, R. J. (1986). *The Nazi Doctors: Medical Killing and the Psychology of Genocide*. New York: Basic Books.

Macagno, F. and Walton, D. (2014). *Emotive Language in Argumentation*. Cambridge: Cambridge University Press,

Resnik, D. (1994). Debunking the Slippery Slope Argument against Human Germ-line Gene Therapy, *The Journal of Medicine and Philosophy*, 19(1), 23-40.

Rizzo M. J. and Whitman, D. C. (2003). The Camel's Nose in the Tent: Rules, Theories and Slippery Slopes, *UCLA Law Review*, 51, 539-592.

Saliger, F. (2007). The Dam Burst and Slippery Slope Argument in Medical Law and Medical Ethics, *Zeitschrift fur Internationale Strafrechtsdogmatik*, 9, 341-352.

Schauer, F. (1985). Slippery Slopes, *Harvard Law Review*, 99(2), 361-383.

Van der Burg W. (1991). The Slippery Slope Argument, *Ethics*, (102), 42-65.

Walton, D. (1992). *Slippery Slope Arguments*. Oxford: Oxford University Press.

Walton, D. (2015). The Basic Slippery Slope Argument, *Informal Logic*, 35(3), 2015, 273-311.

Walton, D. and Macagno, F. (2015). The Importance and Trickiness of Definitional Strategies in Legal and Political Argumentation, *Journal of Politics and Law*, 8(1), 2015, 137-148.

Walton, D., Reed, C. and Macagno, F. (2008). *Argumentation Schemes*. Cambridge: Cambridge University Press.